

Instrumentation For Multiple Radiation Detection Based On Novel Mercurous Halides For Nuclear Planetology, Phase I

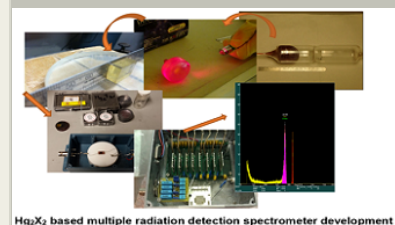
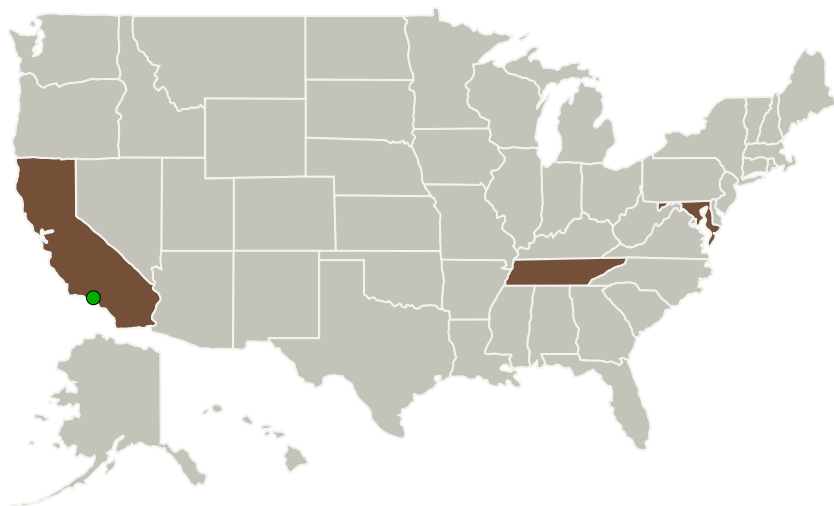
Completed Technology Project (2015 - 2016)



Project Introduction

We propose a spectrometer that employs a single room temperature semiconductor detector that can perform both gamma and neutron spectroscopy. The proposed detector is based on the novel mercurous halide materials, Hg_2X_2 ($\text{X}=\text{I}, \text{Cl}, \text{Br}$). The mercurous halides are new wide band-gap semiconductor detector materials that can provide radiation detection with low cost, high performance and long term stability. Despite years of research, no explored room temperature semiconductor detection candidates can satisfy all three features simultaneously. At Brimrose, we have successfully developed the growth procedures for high quality Hg_2X_2 crystals for long wavelength infrared (LWIR) imaging systems. Recently, we have been able to engineer our growth process toward gamma radiation detection and have demonstrated initial encouraging detector response from Hg_2I_2 to both gamma and alpha particle incident radiations. The focus will be on the material engineering aspect of the detector material itself (i.e., crystal growth and post growth processing), as well as on the detector fabrication and system design. The proposed mercurous halides-based nuclear instrument can be used onboard NASA's orbiters and landers for space planetology. Specifically, it can be used to determine surface and sub-surface composition of planetary bodies via both gamma spectroscopy and neutron spectroscopy.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Brimrose Technology Corporation(BTC)	Lead Organization	Industry	Sparks, Maryland
Fisk University	Supporting Organization	Academia	Nashville, Tennessee
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	Maryland
Tennessee	

Project Transitions

▶ **June 2015:** Project Start

✓ **June 2016:** Closed out

Closeout Summary: Instrumentation For Multiple Radiation Detection Based On Novel Mercurous Halides For Nuclear Planetology, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138997>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Brimrose Technology Corporation (BTC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

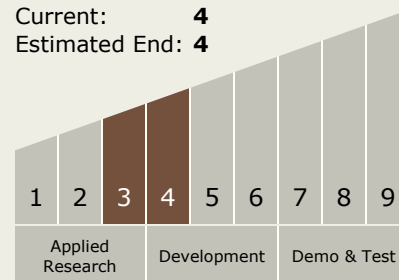
Carlos Torrez

Principal Investigator:

Henry Chen

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**

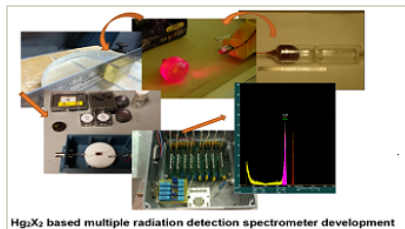


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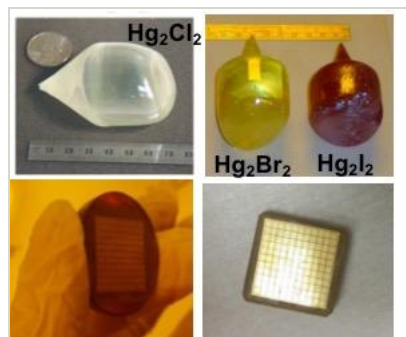
Images



Briefing Chart Image

Instrumentation For Multiple Radiation Detection Based On Novel Mercurous Halides For Nuclear Planetology, Phase I

(<https://techport.nasa.gov/image/133181>)



Final Summary Chart Image

Instrumentation For Multiple Radiation Detection Based On Novel Mercurous Halides For Nuclear Planetology, Phase I Project Image
(<https://techport.nasa.gov/image/129276>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System